PROPOSED AMENDMENT

09/289,600

REMARKS

This proposal is submitted for the Examiner's consideration in preparation for the personal interview scheduled with the Examiner for May 7, 2003. A complete set of the claims, including proposed amendments, is presented in the attached Appendix.

If this proposal were to be formally submitted for entry, claims 1-31 and 35-36 would be the claims pending in the application. This proposal amends claims 1-6, 9, 13, 17, and 20, adds claims 35 and 36, cancels claims 32-34, and addresses each point of rejection raised by the Examiner.

Claims 1-34 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang in view of Minami.

In Chang, the exemplary <u>resolution of the image</u> is 3 x 3. *See* Chang column 4, lines 9-11. Thus, in Figs. 1 and 2, there are nine picture elements, each picture element addressing a single cell of a monochrome screen. The cells in Chang are monochrome, each cell having N-levels of simulated grayscale formed from N-1 pages. Each cell in Chang is individually addressed, such that an output luminance/level must be specified for each of the 9 cells of the 3x3 image. *See* Chang column 3, line 45 to column 4, line 42. Specifically, each cell is addressed based on its X-Y coordinate in the image, using a "mod" function to determine the on-off page sequence of each cell for a respective level of grayscale. In Figure 2 of Chang, all 9 cells are set to a same gray level to demonstrate how the mod function assigns the on-off sequence across the pages to the various cell.

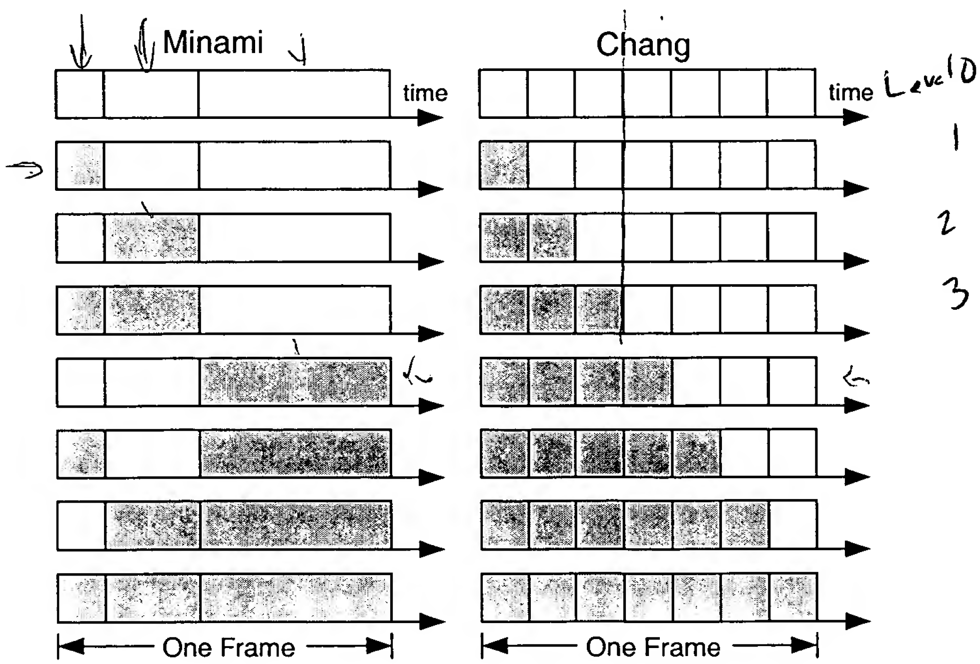
In Chang, the monochrome image is stored in ROM module 12, and is output as a grayscale image to the CPU 11. *See* column 5, lines 22-23. The CPU converts the monochrome image into (N-1) pages of on-and-off signals (V_{rm3}, V_{rm0}) that are sequentially applied to the LCD to simulate a desired gray level for each picture element of the image. *See* column 5, lines 43-53. The pages are generated by applying a "mod" function to generate the series of on-and-off pages for each cell of the 3 x 3 image, based on the gray level needed for each respective picture element of the grayscale image. *See* column 3, line 37 to column 4, line 42. Each page is sequentially transferred LCD row and column drivers 16 and 17 so as to display the pages one-

at-a-time on the LCD screen 18. *See* column 5, lines 32-35. The waveforms of the signals FR, FP, LP, and SCP, are used for synchronization. *See* column 5, lines 36-42.

Minami discloses a method for reducing dynamic false contours on displays utilizing a power series of luminescence to produce each frame of video images.

The Examiner's stated support for combining Chang and Minami is based upon the Abstract and Fig. 1 of Minami, with nothing to suggest consideration of whether the combination would actually work, or whether the teachings of Minami are even relevant to Chang.

In Chang, the frames are broken into a series of pages displayed at a fixed rate, whereas Minami is directed to systems which use power sequences. The problem solved by Minami is a problem for power-sequence based devices, of which Chang is not. For example, consider a three-bit (eight level) examples of a single picture element of a single frame according to each reference.



In Minami, the three bits control three time-based sub-fields. The first sub-field has a time t; the second subfield has a time 2t; the third sub-field has a time 4t. The length of the frame in time is therefore 7t. In comparison, Chang employs sub-fields each having a time t. The length of the frame in time is again 7t.

The problem solved by Minami is what happens when motion occurs on the display, causing a band shape to be perceived by a viewer as a result of the power sequence. This band, which is a specific characteristic of power sequences (1, 2, 4, 8,...), is a result of the different lengths of time of the subfields. If a picture element moves from point A to point B with a fluctuation in luminance level, the arrangement of sub-fields affects human perception, as shown by the "R" lines in Fig. 4 of Minami.

In comparison, Chang uses sub-fields of equal duration, and teaches to mix up the on-off sequence across (in terms of time) each cell according to a "mod" function. No power sequence is employed, and even with the benefit of hindsight, it is not clear what would be necessary to modify the "mod" function of Chang to effectively utilize the power-sequence-based solution in Minami. Based on the differences of operation, there is no basis for concluding that Chang even experiences dynamic false contour. Accordingly, there would be absolutely no reason to apply the teachings of Minami to Chang.

That Fig. 2 of Chang shows groupings of 9 cells each having the same level of grayscale is irrelevant to the various claim limitations of the present application. There is none of the claimed relationships between a picture element of the 3 x 3 image of Chang and a spatial series of displayed cells. Each spatially adjacent cell is Chang corresponds to a single picture element of the image stored in ROM 12, and each spatially adjacent cell is capable of simulating the same number of levels of grayscale, having the same maximum output tone level.

For a time modulation embodiment of the present invention, the closest thing in Chang to the claimed cell signals would be the sequence of the page-stored on-and-off patterns generated for each cell based on an application of the "mod" function to each picture element of the monochromatic image. However, even for such a narrow embodiment of the present invention, Chang is readily distinguished from claim 1.

Claim 1 requires generation of a cell signals for each of the series of spatially adjacent cells of a respective picture element based on the monochromatic image signal indicating an output luminance of each picture element of a monochromatic image. Thus, there is a one-to-x relationship between one picture element of the monochromatic image and the series of x cells expressing that element. Moreover, in an exemplary embodiment the luminance output is based

on an average of multiple spatially adjacent cells. In comparison, in Chang, each picture element of the monochromatic image corresponds to a specific cell. Each picture element of the image corresponds to a black-and-white page sequence assigned to a respective cell. Thus, in Chang, there is a one-to-one relationship between one picture element of a monochromatic image and the one cell expressing that element.

Further, the FR, FP, LP, and SCP signals of Minami are used for synchronization (*see* column 5, lines 36-42), which does not suggest "a monochromatic image signal indicating output luminance of each picture element," nor the "cell signal ... which determines an output tone level of the cell" as required by claim 1. Synchronization signals exist without regard to the information being displayed.

Nor does Minami teach or suggest at least the above described features of independent claim 1.

Further, claim 3 requires that the cell signals are generated so that the output luminances of the spatially adjacent cells of a respective picture element change at an inclination according the a tone gradient vector of picture elements around the picture element corresponding to the cells. For example, if an adjacent picture element on the left is light, and an adjacent picture element on the right is dark, and the series of cells are arranged left to right, then the left most cell would be lightest, and the right most cell would be darkest, the gradient of the cells being arranged according to the tone gradient vector. In comparison, Chang offers no teaching or suggestion of such consideration of a tone gradient, nor to even consider the level of gray scale of surrounding cells/picture elements. The method of Chang resolves the blinking effect on a user's eyes by mixing up the black-and-white page assignments for each cell using a "mod" operator, independently generating the black-or-white to each cell/picture element. No consideration is given to either the black-or-white state of surrounding cells/picture elements, nor to the overall gray level of surrounding cells/picture elements.

With regard to independent claim 13, no *prima facie* case for rejection has been offered by the Examiner. Neither Chang nor Minami teaches or suggests at least two of the series of cells having maximum output levels different from each other, nor driving means which drives the series of cells of a respective picture element so that the output level difference per one level

of said three or more levels differs from each other between the at least two of the series of cells. In Chang and Minami, all of the cells emitting light in a same color have the same maximum output level, and the level differences (*e.g.*, the four levels of gray in Chang) between cells are identical.

With regard to independent claim 18, the Examiner asserts that the "CIE chromaticity diagram is a standard diagram that is well know[n] in the art..." CIE chromaticity diagrams have been a standard for defining color since 1931. Thus, using a CIE chromaticity clearly defines the metes-and-bounds of claim 18 because of how well understood such diagrams are. Claim 18 requires a particular range of coordinates on the chromaticity diagram, which the Examiner has not addressed in rejecting claim 18. The fact that the diagram itself is well known is irrelevant to the invention defined by the claim, such that no *prima facie* case for rejection has been presented. Applicant would further submit that chromaticity is associated with a gamut of output colors, but that prior to the present invention, one skilled in the art would not have described a monochrome display relative to the CIE chromaticity as bounded by the claims.

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<u>APPENDIX</u>

Version With Markings To Show Changes Made

<u>IN THE CLAIMS</u>:

Claims 32-34 are canceled.

The claims are amended as follows:

1. (Thrice Amended) A monochromatic image display system comprising:

a display device comprising a plurality of picture elements, each picture element comprising a series of cells, each cell expressing tones in [~~multiple~~] <u>three or more</u> levels; and

a cell signal generating means which generates, based on a monochromatic image signal indicating an output luminance <u>of each picture element</u> of a monochromatic image, a cell signal for each cell <u>of each respective picture element</u> which determines an output tone level of the cell, so that an average of the output luminances of all the cells within each respective picture element correspond to an output luminance of the respective picture element,

wherein each cell of said series of cells emits light <u>in a same color,</u>

wherein the output luminances of the plurality of picture elements express said monochromatic image, and

wherein the series of cells of a respective picture element expressing tones of the [~~multiple~~] <u>three or more</u> levels are spatially adjacent.

2. (Amended) A monochromatic image display system as defined in Claim 1 in which the cell signal generating means generates cell signals so that the output luminances of the cells <u>of the respective picture element</u> are substantially uniform.

3. (Amended) A monochromatic image display system as defined in Claim 1 in which the cell signal generating means generates cell signals so that the output luminances of the cells <u>of the respective picture element</u> change at an inclination according to a tone gradient vector of picture elements around the respective picture element corresponding to the cells.

4. (Amended) A monochromatic image display system as defined in Claim 1 in which the cell signal generating means intensity-modulates [~~the~~] input signal levels to the respective cells independently of each other.

5. (Amended) A monochromatic image display system as defined in Claim 1 in which the cell signal generating means time-modulates [~~the~~] input signal levels to the respective cells independently of each other.

6. (Amended) A monochromatic image display system as defined in Claim 5 in which the cell signal generating means time-modulates [~~the~~] input signal levels to the respective cells by frame.

7. (Original) A monochromatic image display system as defined in Claim 6 in which the cell signal generating means determines the output tone level of each cell so that the output luminances of frames are substantially uniform.

8. (Original) A monochromatic image display system as defined in Claim 6 in which the maximum number of tones which can be expressed by each cell per one frame is not smaller than 64 (6 bits).

9. (Amended) A monochromatic image display system as defined in Claim 1 further comprising a tone number conversion means <u>for</u> [~~which carries~~] <u>carrying</u> out a tone number conversion processing on an input original monochromatic image signal, thereby generating said monochromatic image signal<u>, wherein a number of tones represented by said monochromatic image signal is no greater than a number of tones which can be expressed by each respective picture element of said monochromatic image display</u>.

10. (Original) A monochromatic image display system as defined in Claim 9 in which the number of tones represented by the original monochromatic image signal is not smaller than 256 (8 bits).

11. (Original) A monochromatic image display system as defined in Claim 1 in which the display device expresses each picture element by three cells.

12. (Original) A monochromatic image display system as defined in Claim 1 in which the display device is a liquid crystal panel.

13. (Thrice Amended) A monochromatic image display system comprising:

a display device comprising a plurality of picture elements, each picture element comprising a series of cells, each cell expressing tones in [~~multiple~~] three or more levels, and at least two of said series of cells having maximum output levels different from each other; and

a drive means which drives the cells of a respective picture element so that the output level difference per one level of said three or more levels differs from each other between said at least two of said series of cells,

wherein each cell of said series of cells emits light in a same color,

wherein the plurality of picture elements express a monochromatic image, and

wherein the series of cells of a respective picture element expressing the tones of [~~multiple~~] three or more levels are spatially adjacent.

14. (Original) A monochromatic image display system as defined in Claim 13 in which the maximum output level of one of said at least two cells is substantially the same as the output level difference per one level of the other cell.

15. (Original) A monochromatic image display system as defined in Claim 14 in which the drive means drives the cells so that said at least two cells express tones in substantially the same number of levels.

16. (Original) A monochromatic image display system as defined in Claim 13 in which the display device is a liquid crystal panel provided with monochromatic filters which are different in transmittance and respectively formed on said at least two cells for each picture

element so that the maximum output levels of said at least two cells become different from each other.

17. (Amended) A monochromatic image display system as defined in Claim 13 in which the display device is an organic EL panel in which said at least two cells for each picture element emit light in the same color at different luminances for a given signal level,

wherein said given signal level indicates an output luminance of the respective picture element having said at least two cells.

18. (Twice Amended) A flat panel image display system using a flat panel-like display device, the display device comprising a series of cells, each cell of said series of cells emitting light in a same color, characterized in that the display device is a monochromatic display device which makes a display in a color which falls within the region surrounded by points (0.174, 0), (0.4, 0.4) and (α, 0.4) as represented by co-ordinates (x, y) on a CIE chromaticity diagram,

wherein α represents the x-coordinate of the intersection of a spectrum locus and a straight line y=0.4, and

wherein the series of cells of a respective picture element are spatially adjacent.

19. (Original) A flat panel image display system as defined in Claim 18 in which the display device is a display device which is provided with at least one of elements including a substrate, a face plate, a diffuser panel, a color filter, a diffuser film, a collimator film, a prism film and a polarizing film which are colored to a predetermined color.

20. (Twice Amended) A flat panel image display system as defined in Claim 18, the display device further comprising a plurality of picture elements, each picture element comprising the series of cells, each cell expressing tones in [~~multiple~~] three or more levels, and the plurality of picture elements expressing a monochromatic image, and

there is provided at least one of:

an area modulation means which controls the output luminance of each picture element by selectively turning on and off input signals to respective cells, for each picture element, independently of each other,

a time modulation means which drives the respective cells for each picture element in a time division system, and

an intensity modulation means which controls input signal levels to the respective cells for each picture element independently of each other,

wherein the cells are driven so that the maximum luminance of each picture element is in the range of $100cd/m^2$ to $10000cd/m^2$.

21. (Original) A flat panel image display system as defined in Claim 20 in which the maximum luminance of each picture element is in the range of $500cd/m^2$ to $5000cd/m^2$.

22. (Original) A flat panel image display system as defined in Claim 18 in which the display device is a liquid crystal panel.

23. (Original) A flat panel image display system as defined in Claim 18 in which the display device is an organic EL panel.

24. (Added) A monochromatic image display system as defined in Claim 4, wherein:

there are M cells in each picture element;

there are L tones expressible by intensity modulation of each cell, excluding a zero tone level;

the zero tone level is expressed when the input signals into each of the cells of a respective picture element are turned off; and

each picture element has a range of M x L + 1 tones, including the zero tone level.

25. (Added) A monochromatic image display system as defined in Claim 5, wherein:

there are M cells in each picture element;

there are N tones expressible by time modulation of each cell, excluding a zero tone level;

the zero tone level is expressed when the input signals into each of the cells of a respective picture element are turned off; and

each picture element has a range of M x N + 1 tones, including the zero tone level.

26. (Added) A monochromatic image display system as defined in Claim 1 in which the cell signal generating means intensity-modulates and time-modulates the input signal levels to the respective cells independently of each other.

27. (Added) A monochromatic image display system as defined in Claim 26, wherein:

there are M cells in each picture element;

there are L tones expressible by intensity modulation of each cell, excluding a zero tone level;

there are N tones expressible by time modulation of each cell, excluding the zero tone level;

the zero tone level is expressed when the input signals into each of the cells of a respective picture element are turned off; and

each picture element has a range of M x L x N + 1 tones, including the zero tone level.

28. (Added) A monochromatic image display system as defined in Claim 1, wherein:

at least two of said series of cells have maximum output levels different from each other; and

said cell signal generating means generates the cell signal for each cell so that the output level difference per one level differs from each other between said at least two of said series of cells.

29. (Added) A monochromatic image display system as defined in Claim 1, wherein said display device is a monochromatic display device which makes a display in a color which falls within a region surrounded by points (0.174, 0), (0.4, 0.4) and (α, 0.4) as represented by co-ordinates (x, y) on a CIE chromaticity diagram, wherein α represents an x-coordinate of an intersection of a spectrum locus with a straight line y=0.4.

30. (Added) A flat panel image display system as defined in Claim 18, wherein the display device comprises a plurality of picture elements, each picture element comprising the series of cells, each cell displaying tones in [~~multiple~~] <u>three or more</u> levels, and the plurality of picture elements expressing a monochromatic image.

31. (Added) A flat panel image display system as defined in Claim 19, wherein said at least one of elements is formed of polyethylene terephthalate colored with an anthraquinone dye to a color of said predetermined color.

32. (Cancelled) [~~A monochromatic image display as defined in claim 1, wherein each cell expresses tones in three or more levels of said same color.~~]

33. (Cancelled) [~~A flat panel image display system as defined in Claim 13, wherein each cell expresses tones in three or more levels of said same color.~~]

34. (Cancelled) [~~A flat panel image display system as defined in Claim 20, wherein each cell expresses tone in three or more levels of said same color.~~]

35. (New) A flat panel image display system as defined in Claim 18, wherein said same color of light emitted by the series of cells is of a blue region on the CIE chromaticity diagram.

36. (New) A monochromatic image display system as defined in Claim 29, wherein said color made by the display is of a blue region on the CIE chromaticity diagram.